

NON-PUBLIC?: N
ACCESSION #: 8803090351
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Quad-Cities Nuclear Power Station, Unit Two PAGE: 1 of 6

DOCKET NUMBER: 05000265

TITLE: Reactor Scram and Emergency System Initiation Caused by Operator
Error - on Wrong Equipment
EVENT DATE: 10/19/87 LER #: 87-013-00 REPORT DATE: 11/12/87

OPERATING MODE: 4 POWER LEVEL: 090

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: K. J. Hill, Technical Staff Engineer
TELEPHONE #: 309-654-2241 Ext. 2150

COMPONENT FAILURE DESCRIPTION:
CAUSE: A SYSTEM: AA COMPONENT: 52 MANUFACTURER: 6080
REPORTABLE TO NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On October 19, 1987, Quad Cities Unit Two was in the RUN mode at approximately 90 percent of reactor thermal power. At 1959 hours, an Equipment Operator (EO) incorrectly attempted to rack out of service an energized 4 kV circuit breaker on Bus 23. As the breaker was withdrawn, the shutter in the breaker cubicle, which was lowered in the racking out process, came in close contact with the energized breaker stabs and flashed to ground. Bus 23 tripped on overcurrent. As a result, a reactor scram and Emergency Core Cooling System (ECCS) initiations and related actuations occurred at 2000 hours. All systems responded as designed except for two minor discrepancies relating to the High Pressure Coolant Injection (HPCI) system. Reactor water level dropped to approximately -60 inches but was quickly restored. A normal scram recovery then followed. NRC notification of this event was completed at 2117 hours.

The cause for this event was personnel error. Disciplinary action was administered. Other corrective actions include: 1. procedure revisions, 2. training sessions, 3. circuit breaker inspections, 4. HPCI system special tests, 5. development of a new training module addressing 4 kV

breakers, and 6. creation of a Emergency Planning position in the Training Department. This report is provided to satisfy the requirements of 10 CFR 50.73(a)(2)(iv).

(End of Abstract)

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PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 MWt rated core thermal power. Energy Industry Identification System (EIIS) codes are identified in the text as (XX).

EVENT IDENTIFICATION: Unit Two Reactor Scram and ECCS Initiation Caused by Operator Error.

A. CONDITIONS PRIOR TO EVENT:

Unit: Two Event Date: October 19, 1987 Event Time: 1959
Reactor Mode: 4 Mode Name: RUN Power Level: 90%

This report was initiated by Deviation Report D-4-2-87-050

RUN Mode(4) - In this position the reactor system pressure is at or above 825 psig, and the reactor protection system is energized, with APRM protection and RBM interlocks in service (excluding the 15% high flux scram).

B. DESCRIPTION OF EVENT:

At 1959 hours on October 19, 1987, Unit Two was in the RUN mode at approximately 90 percent reactor thermal power. An Equipment Operator (EO) was in the process of taking out-of-service (OOS) the 4kV circuit breaker (BKR) at Bus 23 (EA) for the 2A Circulating Water Pump (CWP) (KE, P). After proceeding to Bus 23, the EO telephoned the control room to indicate that he was beginning work on the 2A CWP OOS. He first laid the OOS cards on the floor in front of the breaker and donned his protective clothing, including face shield, gloves, and protective apron. He then identified the 2A CWP circuit breaker, and verified via breaker light indication that the breaker was open. He next turned away from the breaker to pick up the OOS cards. When turning back to the 2A Circulating Water Pump breaker, he unknowingly moved to the left, to the adjacent breaker, which was the 2A Control Rod Drive (CRD) (AA) pump breaker. Without a further check of breaker identification, he then opened the control cabinet door to the incorrect breaker. Because the

door opens left-to-right, this action prevented further easy identification of either breaker by covering the labeling of both. After pulling the "CLOSE" and "TRIP" fuses as required per QOP 6500-4 (Racking Out a 4160 Volt Manual Operated Air Circuit Breaker), the EO proceeded to slide open the racking screw shutter and insert the racking wrench. The racking screw shutter slid open easily, and although not specified by the procedure the EO did not check the breaker open/close window indication at the bottom of the breaker. The breaker that he was actually working on was closed, supplying power to the operating 2A CRD pump. As the circuit breaker was being racked out (approximately one turn), it became apparent that the breaker was withdrawing from the cubicle with difficulty, so the EO stopped to determine the cause. At this time, 19:59:25 hours, the shutter in the 2A CRD pump breaker cubicle, which had been lowered during the racking out process, came in close contact with the energized breaker stabs, resulting in a flash to ground.

The following chronology of events was taken from the sequence of events log (IQ) as printed on the Unit printer. At 19:59:25 hours Bus 23 tripped on overcurrent. The

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loss of Bus 23 resulted in the loss of the 2A and 2B Condensate Booster Pumps (SD) and the auto-initiation of the 1/2 Diesel Generator (DG) (EK). The loss of the condensate booster pumps resulted in a trip of the 2B and 2C Reactor Feed Pumps (RFP) (SJ) on pump low suction pressure. With the loss of the RFPs, reactor water level began decreasing rapidly. At approximately 19:59:32 hours, the 1/2 DG closed in to feed Bus 23-1 (EK). At approximately 19:59:33 hours, a full reactor scram (JS) and Groups II and III isolation (JM) occurred due to reactor vessel low water level (+8 inches) (JE). The following Engineered Safety Feature (ESF) actuations also occurred as designed, due to a low reactor water level signal:

1. Control Room Ventilation (VI) changed to 100 percent recirculation,
2. Standby Gas Treatment (BH) automatically started,
3. Unit One and Unit Two Reactor Building Ventilation System (VA) automatically isolated.

Vessel level continued to decrease and at approximately 20:00:27 hours, the Unit Two DG (EK) auto-initiated, a Group I isolation (JM) occurred, and both the High Pressure Coolant Injection (HPCI) (BJ) system and the Reactor Core Isolation Cooling (RCIC) (BN) system auto-initiated due to

reactor vessel low-low water level (-59 inches) (JE). At 20:00:53 hours, the RCIC system reached full pump flow. The HPCI System never injected into the vessel. Vessel level had reached approximately -60 inches before the Unit Two Nuclear Station Operator (NSO) restarted the 2B RFP at 20:01:11 hours and vessel level began increasing. The NSO checked RCIC and found it operating satisfactorily. The NSO checked HPCI and found all valves except AO-2301-64 (BJ, LOV) and SOV-2301-65 (BJ, LOV) lined up for an injection into the vessel. The Emergency Bearing Oil Pump (EBOP) (BJ) was running, the Auxiliary Oil Pump (AOP) (BJ) was off, and the Gland Steam Exhauster (BJ, VX) was off. At 20:01:20 hours, the HPCI and RCIC low-low reactor vessel level initiation signal cleared. At 20:01:59 hours, reactor water level reached 0 inches. Vessel level continued to increase until the RFP and RCIC tripped on high reactor water level (+48 inches). The feedwater regulating valves (SJ) were then isolated and vessel level was maintained with the low flow feedwater regulating valve, AO-2-643 (SJ). A normal scram recovery then proceeded. NRC notification via the Emergency Notification System (ENS) was completed at 2117 hours on October 19, 1987. To comply with the requirements of 10 CFR 50.72, this notification should have been completed within one hour of the event. This notification addressed the reactor scram and Emergency Core Cooling System (ECCS) initiation. The reactor scram requires a four hour notification per 10 CFR 50.72. The ECCS initiation, requires a one hour notification per 10 CFR 50.72. A Generating Station Emergency Plan (GSEP) Unusual Event was declared at 2130 hours and immediately terminated at 2131 hours on October 19, 1987. NARS notification of the GSEP Unusual Event classification and termination was made at 2132 hours on October 19, 1987. The GSEP classification was not timely (1.5 hours after the event) and only one NARS form was used for both the classification and termination. NRC notification of the GSEP Unusual Event classification and termination was made at 2215 hours on October 19, 1987. The reactor was placed in the Cold Shutdown mode at 0200 hours on October 20, 1987.

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C. APPARENT CAUSE OF EVENT:

This event is being reported according to 10 CFR 50.73(a)(2)(iv), which requires the reporting of any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

The cause of this event has been attributed to personnel error. The Equipment Operator inadvertently racked out an energized breaker which lowered the cubicle shutter until it came in close contact with the energized breaker stabs causing a flash to ground and the electrical bus to trip. Contributing to this event is the failure of the racking

screw shutter mechanism. This shutter is mechanically interlocked with breaker position to prevent the shutter from being opened if the breaker is energized. In this event the shutter slid open easily even though the breaker was energized. An inspection of the shutter mechanism after the event revealed no obvious interlock linkage damage. Additional contributing causes of this event are insufficient operator training and procedures. 4kV breaker operation and interlocks are not adequately addressed in operator training. The procedure referenced for this operation, QOP 6500-4, lacks detail and contains an incorrect precaution statement indicating that opening the racking screw shutter causes a breaker trip.

The performance of the HPCI system has been thoroughly reviewed by Station personnel, BWR Engineering Department, General Electric representatives and Commonwealth Edison Nuclear Operations personnel. It was determined that the system functioned as designed with a momentary initiation signal. The start sequence of the HPCI turbine is such that the auto-initiation signal must be present for at least 15 to 20 seconds for the turbine to come to speed and remain running. There is no seal-in of the initiation signal. The system is designed for the pump to reach full rated flow approximately 25 seconds after auto-initiation. Personnel in the control room at the time of the event, including the Station Control Room Engineer who was monitoring reactor water level, observed vessel level to drop below -59 inches only momentarily (less than 15 seconds). An as-found calibration check (QIS 11) performed on the ECCS reactor water low low level switches verified the switches to be in calibration. Therefore, it is concluded that the low-low water level initiation was not present for a sufficient duration of time for the HPCI turbine to start and reach full speed. All valve actuations associated with system auto-initiation have seal-in circuits to bring them to completion even if the initiation signal is sporadic, thereby explaining the observed valve lineup. The turbine gland steam exhaustor should start and continue running. The turbine auxiliary oil pump will run only as long as the initiation signal is present or until the turbine shaft driven oil pump begins developing pressure as turbine speed increases. The emergency oil pump will start and continue running as pressure decays in the lube oil header. An as-found calibration check was also performed on the HPCI oil system pressure switches. The check determined the switches to be in calibration. The only discrepancies noted in this event were the gland steam exhaustor not starting and valves AO-2301-64 and SOV-2301-65 not closing. Subsequent testing of the HPCI system was performed and all equipment operated as designed.

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D. SAFETY ANALYSIS OF EVENT:

The safety of the plant and personnel was not affected during this event. The arcing breaker caused some damage to adjacent equipment but the EO who racked out the energized breaker was not injured.

The low reactor level instrumentation is set to trip at greater than 8 inches and initiates a scram and closure of Groups 2 and 3 isolation valves. This is intended to prevent perforation of fuel cladding even in the event of the maximum steam line break. The low-low reactor level instrumentation is set to trip at greater than -59 inches and initiates closure of Group 1 isolation valves, activates the Emergency Core Cooling (ECC) subsystems, starts the emergency diesel generator, and trips the recirculation pumps. This trip setting is chosen to prevent melting of fuel cladding and to accomplish post accident cooling even in the event of a complete circumferential break of a 28 inch recirculation line. Since this event did not involve a steam line break and vessel level never dropped below -60 inches, there was no damage to fuel cladding and no uncontrolled radioactive release.

Except for the discrepancies noted on the HPCI system, all Engineered Safety Features acted as designed to bring the reactor to stable conditions. The discrepancies noted on the HPCI system would not prevent turbine operation if the initiation signal had been present long enough for turbine startup to occur.

E. CORRECTIVE ACTIONS:

This event has been discussed with members of the Operating Department. Specific emphasis was placed on ensuring the correct equipment is identified prior to taking any actions. Training sessions will be held with station personnel to discuss the lessons learned from this event including personnel safety aspects. This will be tracked by Nuclear Tracking System (NTS) number 2652008705000.1. The EO involved in this event was disciplined. A review was conducted of 4 kV switching procedures and revisions have been implemented as necessary. Additional labeling inside each 4 kV cubicle will be completed (NTS 2652008705003). A magnetic instructional aid is in use to ensure the proper breaker has been located prior to the initiation of racking out the breaker. Current training on electrical switching will be reviewed and a training module discussing breaker operation, interlocks and other associated items will be initiated (NTS 2652008705000.4). All Equipment Operators and Shift Foremen have received documented special 4 kV breaker training as a result of this event.

A preliminary inspection of all racking screw shutter mechanisms on 4 kV horizontal circuit breakers at Quad Cities Station was performed by

Electrical Maintenance (both Units One and Two). A more thorough inspection with repairs and/or adjustments performed will be completed as per Electrical Maintenance scheduling (NTS 2652008705000.7).

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To verify proper operation of the HPCI system, a simulated auto initiation test was performed on October 21, 1987 with the reactor in cold shutdown. This test is documented in Quad Cities Station Special Test No. 2-78. During this test, all equipment functioned as designed. After the startup of Unit Two, QOS 2300-13 (HPCI System Hot Fast Initiation surveillance) was performed successfully twice. This proves conclusively that the HPCI system will start if needed.

A new Emergency Planning position has been created in the Station Training Department. An ongoing training program will be developed to address aspects of Emergency Planning, i.e., Emergency Action Levels, event classifications, event notifications (NTS 2652008705001). All personnel having responsibilities in this area will receive periodic training that should result in improvement in this area. The Station is aware of the importance of prompt notification and is considering methods to improve the timeliness of notifications to NRC and other agencies (NTS 2652008705002).

F. PREVIOUS EVENTS:

There have been no previous reportable occurrences at Quad Cities Station of a reactor scram being caused by an error in racking out a breaker. There has also been no prior occurrence in which reactor water level has dropped below the ECC systems setpoint of -59 inches.

G. COMPONENT FAILURE DATA:

The circuit breaker which was mistakenly racked out was manufactured by General Electric, type AMH-4.76-250-OD.

ATTACHMENT # 1 T

ANO # 8803090351 PAGE: 1 of 1

Commonwealth Edison DEVIATION REPORT
DVR NO. 4 - 2 - 87 - 050
STA UNIT YEAR NO.

TITLE OF DEVIATION: UNIT 2 SCRAM

DATE OCCURRED: 10/19/87 TIME OCCURRED: 1959

SYSTEM AFFECTED: 6400

PLANT STATUS AT TIME OF EVENT: MODE: RUN, POWER: 90%

TESTING: NO

DESCRIPTION OF EVENT: UNIT 2 SCRAMMED ON LOW REACTOR WATER LEVEL WHEN BUS 23

TRIPPED. THE BUS TRIPPED WHEN THE 2A CRD PUMP BREAKER WAS RACKED OUT WHILE THE PUMP WAS RUNNING. THE OPERATOR WAS SUPPOSED TO RACK OUT THE 2A CIRC WATER PUMP BREAKER. REACTOR LEVEL REACHED ABOUT -59 INCHES AND AN ECCS INITIATION OCCURRED.

POTENTIALLY SIGNIFICANT EVENT PER NSD DIRECTIVE A-07: YES

10CFR50.72 NRC RED PHONE NOTIFICATION MADE: 1 HOUR TIME: 2117

RESPONSIBLE SUPERVISOR: J. SWALES DATE: 10/22/87

OPERATING ENGINEER'S COMMENTS: HPCI DID NOT INJECT, BUT IT APPEARS THAT THIS WAS CAUSED BY THE SIGNAL CLEARING IN SUCH A SHORT TIME THAT THE AUX OIL PUMP DROPS OFF WHEN THE INITIATION SIGNAL CLEARS. A REACTOR FEED PUMP WAS IMMEDIATELY STARTED AND LEVEL WAS RESTORED. RCIC DID INJECT.

30 DAY REPORTABLE/10CFR 50.73(a)(2)(iv) LER # 87-013

PRELIMINARY REPORT COMPLETED AND REVIEWED: B. R. STRUB,
OPERATING ENGINEER
DATE: 10/22/87

INVESTIGATION REPORT & RESOLUTION ACCEPTED BY STATION REVIEW:
/s/ G. Speill,
/s/ /s/ J. Kopay, /s/ G. Tietz

RESOLUTION APPROVED AND AUTHORIZED FOR DISTRIBUTION: /s/
STATION
MANAGER DATE: 11/18/87

ATTACHMENT # 2 TO ANO # 8803090351 PAGE: 1 of 1

Commonwealth Edison

Quad Cities Nuclear Power Station
22710 206 Avenue North
Cordova, Illinois 61242
Telephone 309/654-2241

RLB-87-315

November 12, 1987

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Reference: Quad-Cities Nuclear Power Station
Docket Number 50-265, DPR-30, Unit Two

Enclosed please find Licensee Event Report (LER) 87-013, Revision 00, for Quad-Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(iv), which requires the reporting of any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature, including the Reactor Protection System.

Respectfully,
COMMONWEALTH EDISON COMPANY
QUAD-CITIES NUCLEAR POWER STATION

/s/

R. L. Bax
Station Manager

RLB/MSK/ekb

Enclosure

cc: I. Johnson
R. Higgins
INPO Records Center
NRC Region III

1101H

*** END OF DOCUMENT ***
